small watershed bill, but that bill did not reach the floor because Public Works Committee members stopped it in the House Rules Committee.[48] Kansas, along with the rest of the Missouri River Basin, was, in the early 1950s, debating the virtues of a proposed Missouri Valley Authority modeled after the TVA, as opposed to the Pick-Sloan plan, a combination of the U.S. Army Corps of Engineers plan and the Bureau of Reclamation plan. Part of Pick-Sloan included the Tuttle Creek Dam on the Big Blue River in Kansas to help protect Topeka, Lawrence, and Kansas City from flooding.

When the Missouri Basin Commission held hearings in Kansas in the summer of 1952 to gauge public sentiment, Bureau of the Budget observers found "a real and growing resistance and resentment toward the Pick-Sloan big dam approach as the solution of all the problems of Kansas."[49] With the cities still pressing for the Tuttle Creek Dam, the nature of the opposition in the valley of the Big Blue River became obvious when Howard S. Miller, a seventy-three-year-old farmer from Morrill, captured the normally safe Republican congressional seat in the 1952 elections.[50] Miller, who had campaigned almost exclusively on the issue of the dam, failed to stop it and lost the next election. But his election had alerted the new Republican administration to the desires of rural people for a small watershed program. After a change in administrations, Congress in 1953 authorized a $5 million "pilot" program on sixty-two watersheds. The following year Congress passed the Watershed Protection and Flood Prevention Act. Amendments to the act have made it possible to construct works for drainage, irrigation, fish and wildlife development, and municipal water supply.

Within the Agriculture Department the flood control work expanded rapidly after the passage of the 1954 act. The Forest Service cooperated on the forestry aspects of projects. Its work on private lands increased. Within SCS the new surveying, planning, engineering, and construction supervision in watershed protection and flood prevention grew to claim a partnership role with the soil conservation operations.

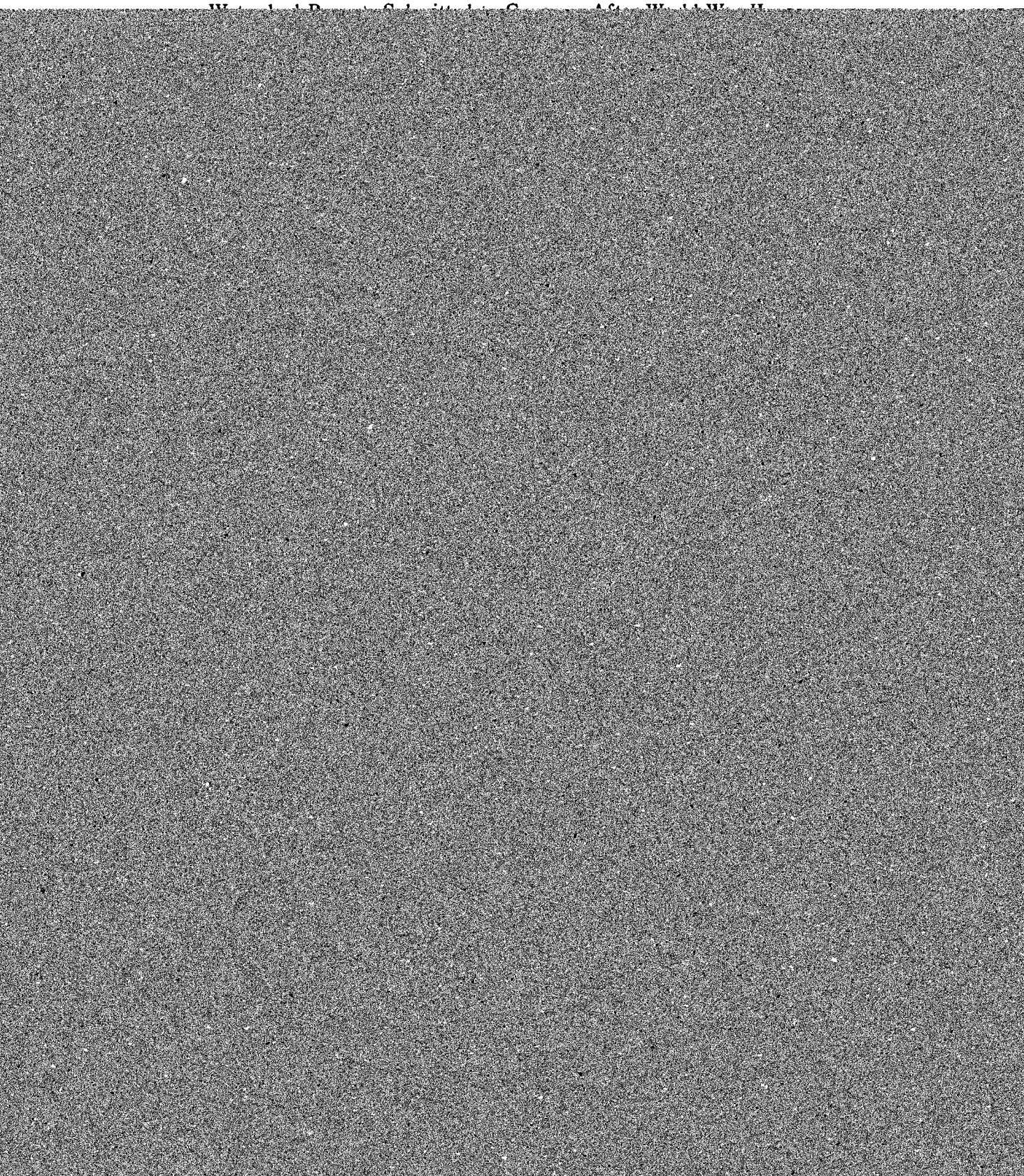
The influence of the activities carried out under the 1936 act in shaping the watershed protection and flood prevention program was obvious. Subjection of long-held assumptions to scientific inquiry created a coterie of believers in small floodwater-retarding structures and channel improvement as a part of the upstream program, and they prevailed in having these included in the program. Land treatment to help infiltration and to protect reservoirs from sedimentation was included in the plans for the watershed. But traditionally, at least until recently, USDA has not shared the cost of land treatment under the Watershed Protection and Flood Prevention Act. The Bureau of the Budget attitude prevailed. Currently, the Agriculture Department and Congress are approving "land treatment watersheds," which are mostly long-term cost-sharing agreements for land treatment without the floodwater-retarding structures. Economic analyses during the 1930s revealed the costs of upstream flooding and provided the economic rationale for an expanded program. Under the 1936 act survey parties designed a remedial project unique to the area. This procedure had a certain rational appeal; it left leeway for a greater number of objectives in project design. But project approval accelerated after the experience gained during the 1930s and 1940s was digested and used to write guidelines and criteria under which small watersheds would be examined for approval.

The agricultural interests had pressed for the program, and most of the projects were sent to the agriculture communities for approval. Projects that would benefit agricultural land received a more sympathetic hearing than those to reduce urban flooding. The new program had decreased emphasis on total river basin planning. After determining that a proposed project qualified under the laws and regulations, the willingness and ability of the local community and the state to pay was the crucial test. The map of the small

watersheds projects reflected areas where the state and local community thought they had upstream flooding problems and were willing to pay their share to correct the problems.

Finally, there is the influence of the act on the Department of Agriculture and on the Soil Conservation Service in particular. The inclusion of a strong water resources program in SCS certainly broadened the base of disciplines. Hugh H. Bennett and Walter Lowdermilk viewed soil conservation as an interdisciplinary undertaking and included the many disciplines in the formative years. The water resources activity brought more hydrologists, engineers, geologists, and economists into the combined soil and water program than might have been expected. In response to the controversies arising from complying with the National Environmental Policy Act, more biologists were added. Furthermore, the method of planning and implementation under the flood control acts provides a basis, if not to ensure that each discipline participate in the joint soil and water conservation effort, at least to encourage such participation.

If there is a lesson for the future here, we should consider this aspect of the history. Currently, two of the important resource questions are ground-water quality and the off-site impacts of erosion and the contributions of agriculture to those problems. Both of these are highly complex scientific problems with complex solutions. The lesson from the experience under the Flood Control Act of 1936 was not to be too quick to extrapolate information from a field or experimental plot to an entire watershed, and that an interdisciplinary approach was needed to study the problems. That lesson should be borne in mind when confronted by other resources problems demanding understanding and calling for corrective measures.



Endnotes

1951), 13-15. For references to some of

Major Burton P. Fleming, October 30, 1935, copy in History Office, Soil Conservation Service, Washington, D.C. For a discussion of the history of the passage of

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[21] Arthur C. Ringland, Oral History Interview, Bancroft Library, University of California, 197-205.

[22] [illegible]

[33] Ibid., 49.

[34] U.S. Congress, Senate, *Congressional Record*, 81st Cong., 2nd sess., 1950, 96, pt. 8: 10482-10483.

[35] U.S. Congress, House, *Department of Agriculture Appropriations for 1951, Hearings*, 81st Cong., 2nd sess., 1950, 1152.

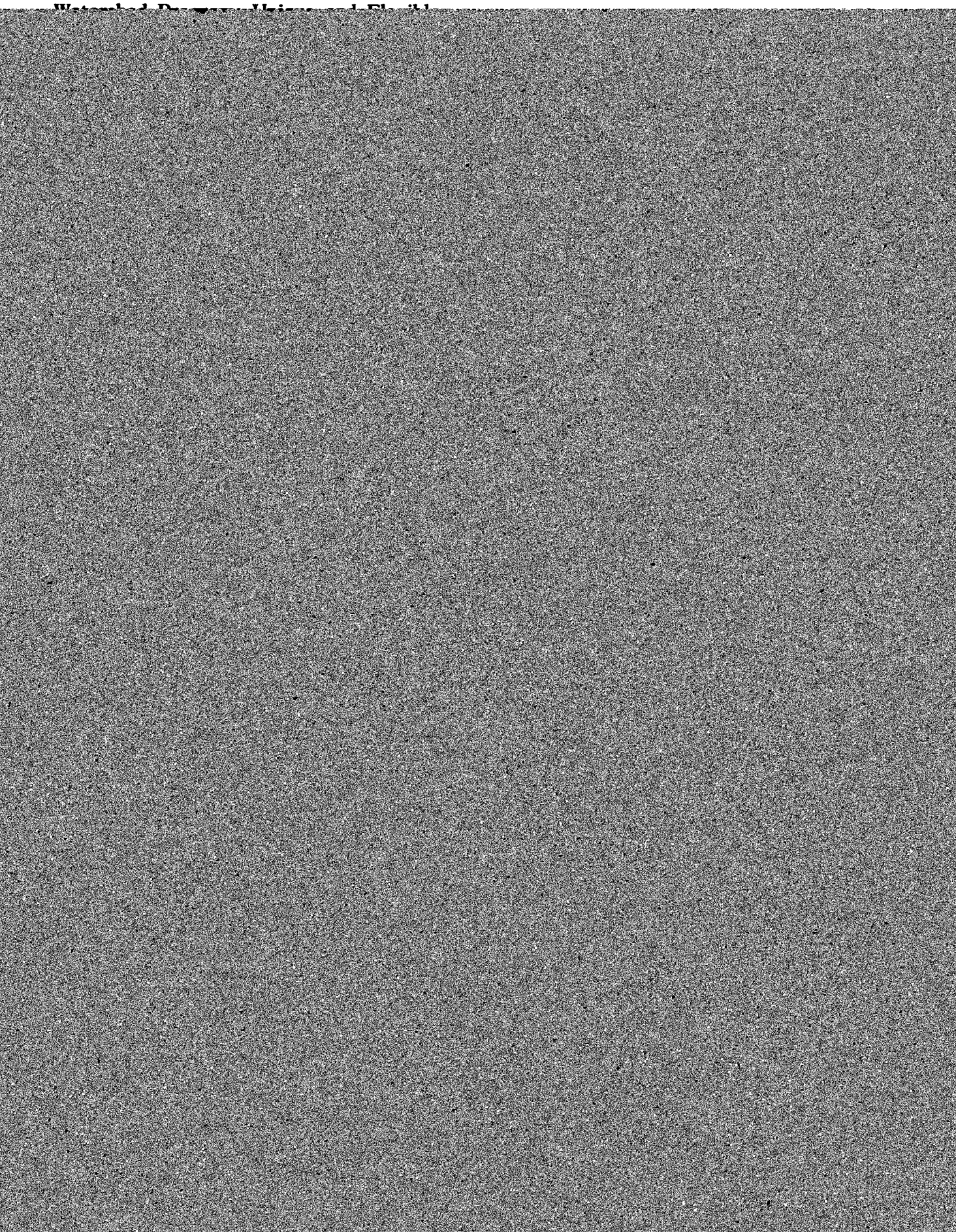
[36] P.L. 81-759, September 6, 1950.

[37] Interview with Jefferson C. Dykes, former assistant chief of SCS, College Park, MD, September 30, 1985.

[38] S. 1812, 78th Cong., Records of the U.S. see "Supplement Information on Hydrologic Agreement and Coordination, Arkansas-White-Red Basins," mimeographed (Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service, September 1953), 45 pp. Copy in the Howard Cook Papers, Office of History, Headquarters, U.S. Army Corps of Engineers, Ft. Belvoir, Virginia.

[47] Maass, "Protecting Nature's Reservoir," 96-97.

[48] Beatrice Hort Holmes, *A History of Federal Water Resources Programs, 1800-1960*, Miscellaneous Publication No. 1233 (Washington, D.C.: U.S. Department of



adjust to the drought.[1] Also, McLaughlin saw the emergency employment programs under the Public Works Administration (PWA) and the Works Progress Administration

federal level, Hopkins suggested requests for the snow survey work should come from the states through their regular proce-

dures for requesting project approval.[7]

term and continued the tour at Marr's behest.[14]

purchased 150 sets of snow sampling equipment with half going to Marr and the other half to Clyde for distribution.[17] But when they received the equipment, Clyde and Church both had some objections. Church found a deficiency in the weighing mechanism; Clyde found fault with the sampling tube from Nevada. McLaughlin wryly noted that snow surveyors from Colorado had no difficulty in using the equipment, and attributed "some of the comments of Clyde and Church to a little prejudice. This is only natural, since we all have our weakness in this regard."[18] In addition to the snow sampling tubes and the weighing mechanism, the group also supplied skis and snow shoes in some cases.[19]

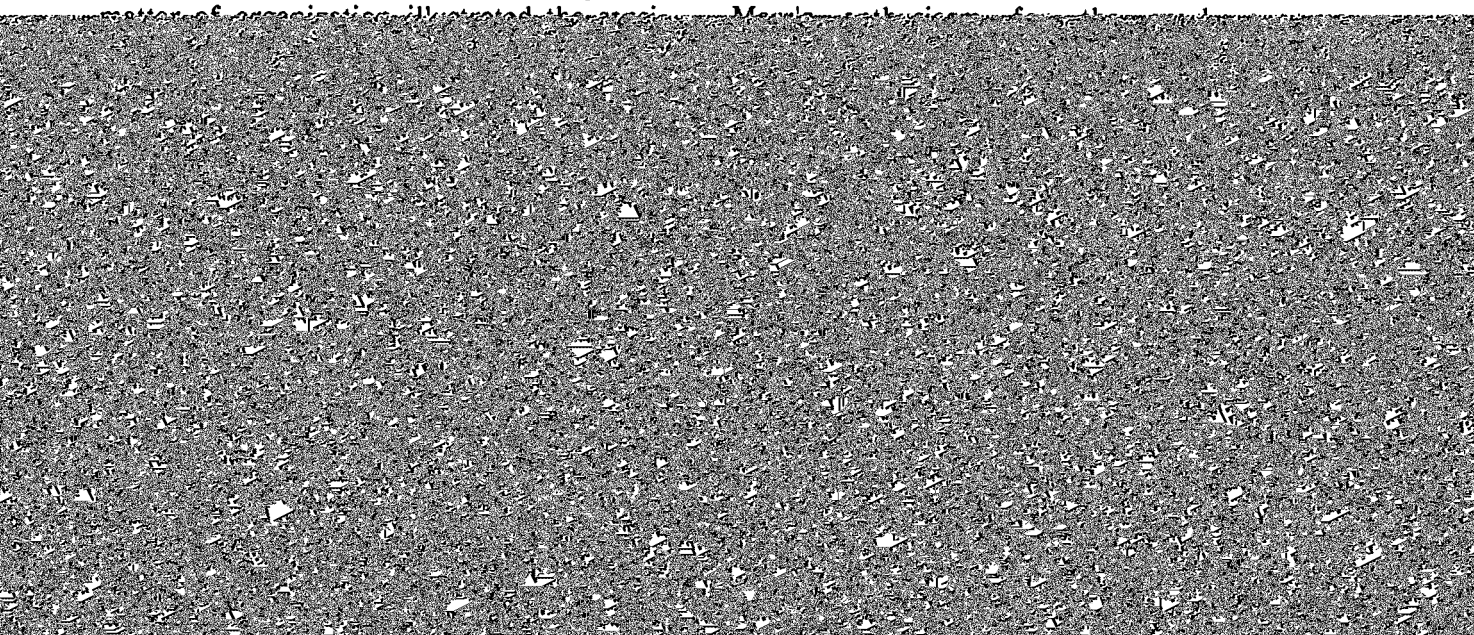
Organization

The absence of long-term data plus the need to emphasize the cooperative nature of the work influenced McLaughlin's organizational decisions. There would be regional offices, rather than a national one. Without historical data, personal knowledge of the rivers and streams would be required if the snow survey group expected to make worthwhile forecasts in the first few years. They needed, and wanted, to make their presence known. They definitely planned to make forecasts from the new snow course data the first year. After some years' accumulation of data, McLaughlin believed it would be possible to have a national office. But there was another reason for regional structure. McLaughlin wanted to have the state agencies involved not only in the surveying, but also in the forecasting. The matter of organization illustrated the [illegible]

Oregon, Idaho, Utah, Wyoming, Colorado, Nevada, and California. As Clyde and Marr travelled about, locating snow surveys, they were "to interest local and state agencies and stimulate an interest in local agencies for snow surveys so they will demand the work."[21]

McLaughlin's group hoped, and suggested, that the cooperators in Nevada, California, Utah, and Oregon who already had extensive networks of snow courses would establish additional ones as well as surveying and mapping existing courses. BAE was to supply the additional snow surveying equipment needed. During the summer of 1935, Marr concentrated on the Snake River and Clyde on the Colorado in establishing new snow courses in Wyoming, Idaho, and Colorado.[22] In selecting the new snow courses, the two considered serviceability, accessibility, and the key areas in a statewide plan, as well as the most urgent requests from cooperators.[23]

During the first ten days of August, 1935, Marr covered 2,300 miles over little travelled roads and trails as he established snow courses in Wyoming and Yellowstone National Park. To avoid the cost of installing a course, he selected areas where little construction work would be needed. Where work was needed he managed to get the cooperation of the Civilian Conservation Corps. Thanks to the cooperation of agencies, the only cost to BAE would be the snow sampling equipment.[24]



He hoped that some of the cooperating state agencies such as the state engineers would be able to use CCC labor and successfully apply for Federal Emergency Relief Act funds for similar work. McLaughlin planned to use all of the scant $15,000 appropriation for equipment. To establish the whole network in the West would eventually require about $100,000 to $300,000.[27]

The Division of Irrigation group never quite secured the large allocation of emergency funding with which to rapidly expand the network by clearing snow courses, building snow cabins, and doing other construction work. Thus they tended to work through the states or with the federal land management agencies. Marr helped Idaho prepare applications for funds to work on snow courses.[28] The federal land management agencies eventually did much of the construction on the lands in their charge. Seeing that BAE had only $15,000 to get the work started, the other agencies knew well that success depended upon their cooperation. Evan w. Kelly, the U. S. Forest Service's regional forester in Missoula, Montana, wrote to his forest supervisors: "The Bureau of Agricultural Engineering is pitifully short of the necessary appropriation from which to finance this important activity;...the various agencies of the Government directly or incidentally interested, must cooperate to the fullest practical extent."[29] The Bureau of Agricultural Engineering had reason to be pleased with the degree of cooperation the first year. They wrote not only to cooperators, but also to their supervisors thanking them. Success the first year accelerated the degree of cooperation. The Corps of Engineers had been doing some snow surveying work on the watershed of the Missouri River. In 1936 they contributed $3,000 so that BAE could set up courses on the Columbia River basin.[31]

Expansion of Work

Following the forecasting work in the spring of 1936, BAE expanded the program in the summer. In all the states there was cooperation with the state engineer and the land-grant agricultural college. Each of the district representatives of the Division of Irrigation made arrangements for the snow cover surveys, provided the equipment, and stocked the cabins. Essentially they handled all of the operations in their state. They reported the snow survey data to the Berkeley office and the Boise office. Clyde handled the work in Utah while Church handled Nevada. Marr, at Boise, and Louie T. Jessup at Yakima, Washington, did Idaho and part of the Columbia drainage. Ralph Parshall at Ft. Collins was responsible for Wyoming and Colorado; and temporarily responsible for New Mexico and Arizona. Arch Work surveyed Oregon and northern California from his office at Medford, Oregon. The state engineer of California did the rest of that state. The district engineer of the U. S. Geological Survey at Helena, Montana, did the Missouri River. The Berkeley and Boise offices jointly publicized the information.[32]

By the second season they had perfected the publicity arrangements. They made measurements monthly from January 1 to May 1. Water supply forecasts were made following the February measurement and the April or May measurement, depending on the state. Broadcasts of information went out on the Farm and Home Hour and various state stations. The cooperating agencies, usually the state engineer or the state agricultural college, put out mimeographed releases. The Weather Bureau also published the data for the federal government. As part of the original agreement with the Weather Bureau, BAE supplied information to them for flood predictions. Sampling for flood predictions required additional visits to the snow courses. The snow survey work was actually a part-time duty for the BAE people, except Marr, who would work full-time on it until no longer needed.[33]

Winter Sports Radio Broadcasts

By the second year of forecasts, the snow survey group began receiving requests for information from winter sports enthusiasts. McLaughlin wanted to get immediately involved since it was a public service and was another "most worthwhile public contact for us...."[34] Initially McCrory resisted,

believing that BAE had to strictly limit itself to the authority in the legislation for

cooperation of the land management agencies, but he also viewed them as

General Correspondence, 1931-1939, Records of Bureau of Agricultural

[17] McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering

[35] McCrory to McLaughlin, February 6, 1937.

[36] McLaughlin to McCrory, July 13, 1937.

[37] McCrory to McLaughlin, January 6, 1937 and January 18, 1937; McLaughlin to McCrory, January 12, 1937.

[38] McLaughlin to McCrory, December 21, 1936, McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering, August 16, 1937.

Snow Surveying Comes of Age in the West

by Douglas Helms
National Historian, Soil Conservation Service

Presented at the Western Snow Conference, Jackson, Wyoming. The author thanks David Balentine (volunteer), Anne Henderson, J. D. Ross, and Jon G. Werner of the Soil Conservation Service for their assistance.

Snow surveying and water supply forecasting entered a new era when the U. S. Department of Agriculture abolished the Bureau of Agricultural Engineering and transferred the Division of Irrigation to the Soil Conservation Service (SCS) on July 1, 1939. The Division of Irrigation was headquartered at Berkeley, California, with Walter W. McLaughlin as chief. The irriga-

under SNOTEL....But in those early days, we believed it was more practical and more profitable, in terms of public relations, to decentralize. I think it was a profitable position to take because they weren't

on the National Broadcasting Company. The offices at Berkeley, Medford, Boise, Fort Collins, and Logan collected information on 64 winter sports areas and had the information ready for a Friday broadcast at 9:00 pm. The National Broadcasting Company carried "Snowcasts" on the San Francisco station as well as two stations in Idaho, two in Washington, four or five in Utah, and one in Colorado (Work, 1989; Work, n.d.; McLaughlin, 1940).

Actually some of the broadcasts contained more than just the information on snow. For instance James Marr in Boise received information from the U. S. Forest Service and the Sun Valley Lodge. Listeners to Winter Sports Broadcast on December 31, 1937 over KIDO in Boise would have heard that a new ski lift and two new ski hills would open at the Payette Lakes winter sports area. At Sun Valley the University of Washington and Dartmouth College competed in a ski meet. Marr encouraged McLaughlin to include the Sun Valley forecast in the broadcast from San Francisco since the lodge drew many of its patrons from the West Coast, and in fact preferred them to local clientele. He wrote to McLaughlin, "In fact, the presence there of local people is looked upon as an obligation rather than an asset. That is, they are taken care of but their coming is not overly encouraged" (Marr correspondence).

included Work, writer Andrew H. Brown, *National Geographic* photographer Jack Fletcher, SCS photographer Robert F. Branstead, Jasper Tucker, Harvey Woods, and Gaeton Sturdevant. The trip commenced in mid-March presumably after the heaviest snows. But snow fell all but two days during the trip. It snowed about ten feet along the journey. While publicity was an unannounced motivation, there was an operational objective. During the snow surveying season, surveyors ascended to various points near the crest of the Cascade range from the valley floor. The snow survey group had conjectured that one trip along the spine of the range in "Sno-Cats" might be a more efficient method of surveying. The trip convinced the group to stick with the earlier method (Work, n. d.; Brown, 1949).

Accuracy of Forecasts and Improvement of Methods

Some of the long-time users of snow surveys in the West were dedicated believers in their value. After the beginning of federal coordination in 1935, the snow survey supervisors added new cooperators and users rapidly. Credibility with these new users rested on the reliability of forecasts. The group chose to use the percentage method developed by James E. Church, which assumed that normal snow cover produced normal runoff. Snow course

the forecast was off it could be off 30 to 60 percent; in a few cases it was off by 100 percent (McLaughlin, 1943). Also the reliability of forecasts varied from one region to another, as the forecasters quickly realized when they moved into the southwest. The variability of spring and summer rainfall meant that forecasts for New Mexico generally had a 55.7 error rate (Beaumont, 1957).

Early snow survey supervisors realized there were many factors which could influence total runoff as well as distribution, but were not taken into account in the percentage method. The proceedings of the

While the snow survey supervisors disagreed with this attitude, they did come to acknowledge the value of snow courses below the permanent snow pack.

Low flows, peak flows, and distribution of flows concerned users for a variety of reasons and involved many interrelated and complicated factors. On rivers without large storage reservoirs, the concern of irrigation farmers was not merely the total supply but the daily distribution of flow. Using historical records for the Logan, Ogden, Weber, and Provo Rivers in Utah, George D. Clyde developed a daily hydrograph and was then able to relate it to forecast curves

More powerful computers allow forecaster today to assess the relative importance of various factors in streamflow.

Uses of Snow Surveys

Although water supply forecasters perceived a need to refine and improve forecasting methods, the percentage method was sufficient to make dramatic demonstrations of the value of snow surveys. The forecasters gradually accumulated examples of the value of snow surveys. George D. Clyde of the Utah Agricultural Experiment Station had made the most dramatic demonstration of the value of snow surveys. Clyde's April

Even the most ardent believers in snow surveys could not predict all the uses. They received inquiries, especially in times of water shortage, from financial institutions, mercantile companies, eastern wholesale houses, power-companies, mines, municipalities, navigational interests, and agriculture (McLaughlin, 1943). In agriculture of course the main interest was in being able to adjust the timing as well as the amount of acreage planted. The sugar beet companies soon learned to await the water supply forecasts before signing contacts and adjusting the acreage contracts to the forecasts (McLaughlin, 1943.) In 1946 snow

> proportions with attendant damage in vulnerable areas.... Also extra high water may be expected on all of these streams during the latter part of May and June. This same situation may also extend to lower Columbia River.

The 1948 Columbia flood resulted in more than 50 deaths and property damage of 100 million dollars. (Clyde and Houston, 1951).

The weather in 1948 provided the exact

Another case of using snow surveys to lessen flood damages occurred in 1954 on the Kootenai River in Idaho. The April 9 forecast mentioned a potential flood and the May 10 survey predicted a 35.5 foot river crest. The town was evacuated and the dikes reinforced with the assistance of federal troops. The river crested at 35.55 feet. (Work, 1955).

The Bonneville Power Administration, in the early 1970s, estimated an annual value of $385,000 for extra power generated in

Oregon newspapers and 13 radio stations publicized the results. At least three magazines published reports covering the entire West, *Reclamation Era, Western Construction News*, and *Electrical West* (Work, 1948).

At the end of the first two decades the snow survey supervisors were generally pleased with the operations. They wanted to expand the system of forecast committees but believed that additional information and snow survey personnel would be needed. One goal of the group in Arch Work's words was to "provide dependable streamflow forecasts for the benefit of farm operators on the smallest tributaries and on downstream industrial developments on major streams" (Work, 1948). The accumulation of data for over ten years made some of this possible, but the group was beset by the time-consuming calculations necessary to deal with the mass of data.

The snow survey supervisors continued to test and promote different modes of mechanizing the snow surveys. They tested over-snow machines produced by private as well as government agencies. They made more use of airplanes to reach high altitude snow markers. In time the water supply forecast group helped develop some of the technology to gather information more rapidly and easily.

Current technology, rather than diminishing our appreciation of snow survey achievements in the decades from 1930 to 1950 helps enhance it. Working with a meager budget, but much cooperation, the snow survey group along with California's Division of Water Resources proved the feasibility of regionwide snow surveys and set the stage for public support of mechanization of the operations.

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Conserving the Plains: The Soil Conservation Service in the Great Plains

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by Douglas Helms
National Historian, Soil Conservation Service

Hugh Hammond Bennett, in early April of [illegible] Depression to get the work started, but the

summarize the themes briefly, Donald Worster in *Dust Bowl: The Southern Plains in the 1930s* found the Dust Bowl to be the result of a social system and an economic order, capitalism, that disrupts the environment and will continue to do so until the system is changed.[3] For Paul Bonnifield in *The Dust Bowl: Men, Dirt, and Depression*, plains farmers struggled successfully not only against drought and depression, but also against too much government idealism, whose most threatening manifes-

problems. Thus on the demonstration projects, it drew together the engineers, agronomists, and range management specialists. They were to work together on common problems rather than concentrating solely on their own discipline. Second, the Soil Conservation Service provided a means to work on what we now call technology transfer from both ends of the spectrum. This seemed particularly appropriate in the plains where farmers had struggled with wind erosion and devised a number of

report in 1936 predicted it would take fifty years to restore the range to a condition that would support 17.3 million livestock units. That goal was reached in the mid-1970s. Other assessments by the Soil Conservation Service over the last twenty years reveal improvements in rangeland conditions.[7]

It would be difficult to attribute responsibility for this to particular agencies, be they federal or state. Even today, SCS works with approximately half of the ranchers in the Great Plains, though many of those not participating are part-time farmer-ranchers, with other sources of income. What is clear is a growing appreciation for the principles of range management in livestock raising. That is a definite shift from the attitude of the early-twentieth century when the concept that rangeland could be grazed too intensively was anathema to many cattlemen. The controversy about grazing intensity was such that Secretary of Agriculture James Wilson in 1901 wrote on the manuscript of a USDA bulletin on the subject: "all too true, but not best for us to take a position now."[8] Shortly after the dust storms in 1935, SCS Associate Chief Walter C. Lowdermilk was addressing a group of plains cattlemen only to have them terminate the meeting when he mentioned the baleful term "overgrazing."[9]

It has been quite a journey from that attitude to general acceptance of range management as being in the interest of the land and the rancher. Several elements seemed crucial to the development. SCS people working with local soil conservation districts and ranchers had to convince them that range management was in their best interests. The field people work for the most part with owner-operators and consequently in a less adversarial climate than the Forest Service and Department of the Interior range specialists, who had to try to improve range conditions by imposition of stocking rates and grazing fees on federal lands. Also, knowing that an educational

field technicians and ranchers alike. That necessity took what had generally been regarded as a research activity into the farm and ranch setting. The key for ranchers in wisely using rangeland was to know the condition of the range, so as to know when and how much it might be grazed without further deterioration. Thus, SCS needed to develop a system of range condition classification, based on scientific principles, that field staff of SCS and ranchers could understand and use.

Early range management pioneers recognized that the composition of the range changed with heavy grazing as cattle selected the taller, more palatable grasses, leaving the shorter, less palatable ones.[10] Following thirteen years of research on National Forest rangelands in the West, Arthur W. Sampson elaborated on this concept and observed that the surest way to detect overgrazing was by observing succession, or the "replacement of one type of plant by another." Furthermore, the grazing value of rangelands was highest where "the cover represents a stage in close proximity to the herbaceous climax and lowest in the type most remote from the climax."[11] Sampson's research prefaced the application of Frederic Clement's ideas about plant communities to practical range problems. A pioneer in prairie ecology, Clement theorized that grasslands were a community of plants in various stages of plant succession progressing toward a climax stage.

Range management experts in the Soil Conservation Service needed a classification system that could be used in the field in working with ranchers. Most range management systems in the 1930s and 1940s recognized the validity of ecological concepts for range management. The distinctiveness of the SCS system was that it would be a quantitative system that applied ecological concepts to range classification and management. Other systems were judged to be too qualitative for practical application in the field. The idea was to develop floristic guides of plant population

percentage of cover under heavy grazing; others will decrease, and in other cases heavy grazing leads to an invasion of plants onto the site. Thus, SCS field staff learned to inventory rangeland for particular "decreasers, increasers, and invaders" in determining whether the range condition fell into one of four categories--poor, fair, good, or excellent.

So as not to make too general a recommendation that would be of limited value, SCS added the concept of "range site" to the study of range management and improved range management practices. Foresters had originally developed the concept of site as an ecological or management entity based on plant communities.[12] Soil type, landscape position, and climate factors would be involved in determining the climax vegetation and should be taken into account when making recommendations for using rangeland following general instructions the local SCS soil conservationists had to delineate range sites in their soil conservation district. Field staff could then work with ranchers to develop a conservation plan that included advice on how best to use the land for grazing and at the same time maintain or improve range condition. In working with farmers SCS tried to ensure that ranchers understood the key plants and their response to light or heavy grazing and deferment. Overall the system was not supposed to focus solely on those plants that benefited cattle most. In concept it adhered to the suggestion of Clement that "There can be no doubt that the community is a more reliable indicator than any single species of it."[13] Advice to farmers might also include information on fencing, development of water supplies, and rotation grazing as range management theories changed over the years. But the reliance on range site and condition as the foundation has persisted to the present.

The range management experience illustrated two important points about the desirability of an interdisciplinary approach to problems and the need to link scientific theory to practical application. Because of its large field staff, SCS was able to test its ideas about using ecological quantification for range classification at numerous sites in the Great Plains. Isolated researchers have no such means for testing theory and classification in practice. The other point involves the emphasis on soil in range classification. Certainly the early ecologists emphasized soil as a part of the biotic environment. Nonetheless, it is quite likely that having both soil scientists and range managers in the same agency led to greater recognition of the importance of soil in site identification than might have been the case otherwise. Range management was but one of the cases in which the so-called action agencies such as SCS had to translate the scientific into the practical. In so doing it removed the prejudice often held toward what was considered strictly research or theoretical musings. The ecological emphasis and the recognition of the other values of rangeland for wildlife and water, not just the forage produced, seem to have increased the popularity of range management with ranchers.

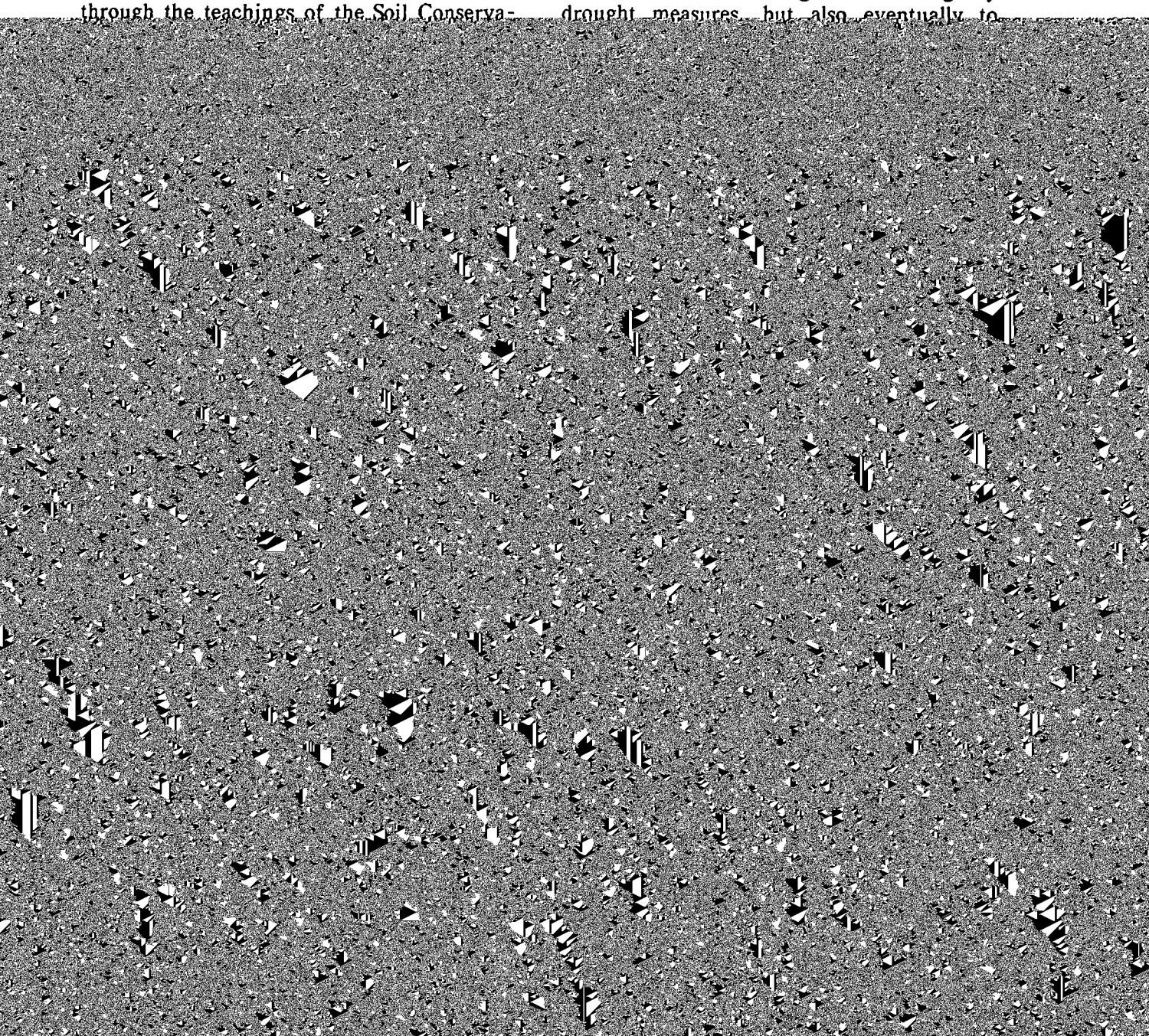
Cultural practices, especially tillage methods, that reduced wind erosion found favor with farmers. Subsurface tillage, or stubble-mulch farming, eliminated weeds that depleted moisture during the summer fallow period while at the same time leaving wheat stubble on the surface to control wind erosion. Farmers employed the rotary rod weeder, or the large V-shaped Noble blade, or smaller sweeps in this work. Developments in planting and tillage equipment and in herbicides have added a whole array of planting and cultural methods that leave crop residues on the surface as well as increasing the organic content of the topsoil. These practices, such as no-till, ridge-till, strip-till, mulch-till, and reduced tillage fall under the general rubric "conservation tillage." The Conservation Technology Information Center, which promotes conservation tillage, estimated in 1988 that 23 percent of the acreage in the southern plains and 32 percent of acreage in the northern plains was planted with conservation tillage.[14] Larger farm equipment can have some adverse effects on conservation, but the powerful tractors make for timely emergency tillage

operations to bring moist soil to the surface to control wind erosion.

SCS's work in the Great Plains always emphasized retiring the most erodible soils to grass. Thus they worked on introducing grass and devising planting methods for the range. The land utilization projects provided a means to test some of these methods. But some plains farmers and absentee owners have continued to use erodible soils for cropland that would be better suited to rangeland or pasture. Nonetheless, as farmers have learned about their land through the hazards of erosion or poor crop production potential, or perhaps through the teachings of the Soil Conserva-

landscape and thus prevent dust storms from gathering force uninterrupted. Chief among them seem to be leaving crop residues on the surface, higher organic content of the soil, wind stripcropping, field windbreaks, and interspersed grasslands. The Conservation Reserve Program, authorized in the 1985 farm bill, that pays farmers to keep highly erodible land in grass has proven most popular in the Great Plains. This is not surprising, because the plains influenced it as they did so many other conservation programs.[18]

The drought that struck the Great Plains in the 1950s led once again to emergency drought measures, but also eventually to



and emergency feed and seed programs. The report called for "installing and establishing those practices which are most enduring and most needed but which are not now part of their normal farm and ranch operations."[22] President Eisenhower introduced the bill that was to become the Great Plains Conservation Program into Congress on June 19, 1956. Under the bill, the Secretary of Agriculture could enter into contracts, not to exceed ten years, with producers. No contract could be signed

conservation while at the same time assisting in the development of economically stable farm and ranch units. Though he did not work on the Great Plains program, H. H. Finnell, former head of SCS's regional office at Amarillo, wrote in *Soil Conservation*, the official magazine of the Soil Conservation Service:

> A more logical and permanent remedy would be the development of an interme-

succeeded.[28] SCS people such as Luker and Dykes recognized that stability was good for soil conservation. The Great Plains Conservation Program was to aim for both. The debate in the work group about farm and ranch planning over sharing the cost of irrigation illustrated the emphasis on the stability of operating units. Many members of the work group believed irrigation should be ineligible for cost-sharing, since it could not be considered a soil conserving the need for cash crops, pasture, forage, and other needs into account. Of course, farmers could start using this plan at the rate they preferred. But the Great Plains program would involve a contract that provided for rather generous cost-sharing. Thus, it was required that the farmers and ranchers have a plan for the whole farm and that they install all the conservation measures, though the government might not be sharing the cost of all of them.

The Great Plains, its climate, geography, and history, influenced another national program, the small watershed program as it is generally called. The Watershed Protection and Flood Prevention Act of 1954 made USDA one of the federal participants in flood control work. SCS took the leadership in working in upstream tributary watersheds of less than 250,000 acres. The flood control side of the project provided federal funding for floodwater retarding structures, channel modifications, and other engineering works to reduce flooding along streams. Watershed protection involved soil conservation practices on farms and ranches in the watershed to reduce the sediment moving to the streams and reservoirs. For much of its history, SCS has generally added soil conservationists to these watershed project areas to assist farmers with the soil conservation practices. USDA has been involved in 1,387 projects covering more than 87 million acres.

The Flood Control Act of 1936 gave USDA authority to work on flood control in the upstream areas. Some SCS people certainly favored retarding structures as part of the program to be submitted to Congress for approval, but they were stymied at the department level. The Flood Control Act of 1944 authorized eleven projects for work by the Department of Agriculture. SCS did build a few retarding structures, but the USDA General Counsel ruled against building any additional ones. In the late 1940s and early 1950s SCS was having difficulty getting additional programs approved. There the matter rested until floods hit the Missouri River in the early 1950s. Kansas City, Topeka, and Omaha demanded completion of the Pick-Sloan plans for flood control on the tributaries of the Missouri. Farmers and residents who would lose their farms and homes stridently resisted. They offered soil conservation and small dams in the headwaters as an alternative. The most vocal were the residents of the Big Blue Valley, north of Manhattan, Kansas. They were joined by residents of Lincoln, Nebraska, who had formed a Salt-Wahoo group to promote a small watershed program. Elmer Peterson, a journalist from Oklahoma, promoted small dams as an alternative in *Big Dam Foolishness.*[32]

That this debate should emanate from Oklahoma, Kansas and Nebraska was in part related to the climate and geography of the plains where farmers could raise corn in the moist bottomland to supplement the hilly grasslands that were too dry to support crops. A small watershed program would provide flood protection to land already used for agriculture, while large dams would inundate the best agricultural land and leave the land suited to grazing or wheat. Because of soil type and moisture the flood plains of the Missouri River tributaries were prized by farmers. Consider the case of N. A. Brubaker, who had 283 acres of land on the Vermillion River in Kansas. The 83 acres of bottom land that supplied feed for his livestock were about to be lost to the Tuttle Creek Dam. His 200 acres of hill land was nontillable. He posed this dilemma to Senator Arthur Capper, "Now if my bottom land will be effected by the water from the Dam, and taken away from me, what use would I have for the 200-acre pasture, as I would not have any land to raise feed for the live stock, and as there would be so much pasture land left in the same way, there would not be much chance of leasing it."[33] A chemistry professor at nearby Kansas State College believed similarly, that the bottomland was the only productive cropland in the Blue River watershed. "The Flint Hills upland provides grazing for cattle but is useless for cropping. There farmers must raise corn on bottomland to finish their cattle. This combination of bottom land for corn and truck farming, and upland for grazing has made the Blue Valley a productive, prosperous region. Without bottom land the entire region will be impoverished and depopulated."[34] The Tuttle Creek Dam and others of the Pick-Sloan plan were built, but the small watershed forces persisted. They met with President Eisenhower and secured his blessing. The small watershed program, authorized in the Watershed Protection and Flood Prevention Act of 1954, spread to the rest of the country. In addition to flood control on agricultural land, it has been used for protection of rural communities,

small towns, recreation, water supply, irrigation, and drainage.

The Great Plains also influenced the conservation provisions in the recent Food Security Act of 1985. The plains have been central to questions of landowners' responsibilities to neighbors in not letting erosion impact on their farms. This, of course, can happen with water erosion, with one farmer in the upper part of the watershed influencing the runoff and sedimentation taking place on a farm in the lower part of the watershed. But the most dramatic examples are usually wind erosion from cropland affecting a neighbor's fields. Generally the cases cited have laid the blame on outside investors looking for a quick profit in wheat. Whether this is an accurate portrayal in all cases, the breaking of rangeland for cropland did in part speed passage of some drastic changes in soil conservation laws and policies. It was undoubtedly one of the factors influencing the conservation provisions of the Food Security Act of 1985.

Probably the opening wedge in events that would change the conservation programs

sources Conservation Act of 1977 mandated studies of the soil and water conservation programs and the development of new policies to attack the problem. The lobbying and studies resulted in some changes in policies, but the drastic changes came with the 1985 farm bill. Events in the plains played a key role in the new conservation authorities that would appear in the bill. Between 1977 and 1982 wheat farmers planted large tracts of grassland in Montana (1.8 million acres), South Dakota (750,000 acres), and Colorado (572,000 acres). In some places the resulting wind erosion proved a nuisance to neighbors. Some vocal and effective local landowners such as Edith Steiger Phillips of Keota, Colorado, wanted action. The Coloradans persuaded Senator Williams Armstrong in 1981 to introduce a bill that would deprive those who plowed fragile lands of price support payments. Such payments have long been seen as inducing speculation and reducing normal caution in planting very erodible land to wheat. Mainline groups like the Colorado Cattlemen's Association and the American Farm Bureau Federation supported the legislative effort. Several com-

The sodbuster provision applies to any highly erodible field that was neither planted to an annual crop nor used as set-aside or diverted acres under a USDA commodity program for at least one year between December 31, 1980 and December 23, 1985. If farmers wish to bring such land into production, they would lose eligibility for USDA programs unless they applied an

Archives, I located some telegrams which indicated that Bennett was usually informed about the location of dust storms. Then I found that Bennett had told fellow North Carolinian and author Jonathan Daniels about the episode. Another variation of the story, which I have not confirmed, is that Bennett had the Senate hearing delayed until the dust storm's anticipated arrival. Jonathan Daniels, *Tar Heels: A Portrait of*

Quantitative Ecology," *Journal of Range Management* 2 (July 1949): 104.

12 Thomas N. Shiflet, "Range Sites and Soils in the United States," in *Arid Shrublands: Proceedings of the Their Workshop of the United States-Australian Rangelands Panel* (Tucson, Arizona, 1973), 26-33.

13 Dyksterhuis, "Condition and Management of Range Land," 111.

14 *National Survey, Conservation Tillage Practices, 1988* (West Lafayette, Indiana: National Association of Conservation Districts, 1988), 6.

15 Data Base, National Resources Inventory, 1982, Soil Conservation Service.

21 Preliminary Report of the U.S. Department of Agriculture on Possible Solutions for Agricultural Problems of the Great Plains, May 1955, Historical SCS Reports, Great Plains Conservation Program Files, SCS, Washington, D.C.

22 *Program for the Great Plains*, U.S. Congress, House Document No. 289, 84th Cong. 2d. sess., 1956, p. 4.

23 *Great Plains Conservation Program*, U.S. Congress, House, Hearings before the Committee on Agriculture, 84th Cong., 2d. sess., 1956, pp. 1-36.

24 Interview with Ervin L. Peterson, September 9, 1981, History Office, Soil Conservation Service, Washington, D.C.

[32] Douglas Helms, "Small Watersheds and the USDA: Legacy of the Flood Control Act of 1936," in *The Flood Control Challenge: Past, Present, and Future* (Chicago, Illinois: Public Works Historical Society, 1988), 67-88; Homer E. Socolofsky, "The Great Flood of 1951 and The Tuttle Creek Controversy," in John D. Bright, ed., *Kansas: The First Century*, Vol. II. (New York, N.Y.: Lewis Publishing Company, Inc., 1956), 494-502.

[33] N. A. Brubaker, Bigelow, Kansas, to Arthur Capper, January 24, 1946, Albert Cole Collection, Kansas State Historical Society. Topeka, Kansas.

[34] J. L. Hall, Department of Chemistry, Manhattan, Kansas to Clifford R. Hope, May 7, 1953. Clifford R. Hope Collection, Kansas State Historical Society, Topeka, Kansas.

[35] Sandra A. Batie, *Crisis in America's Cropland* (Washington, D.C.: Conservation Foundation, 1983), 5.

[36] Earl L. Butz, "Produce and Protect," *Journal of Soil and Water Conservation* 28 (1973): 250-251.

[37] Kenneth E. Grant, "Erosion in 1973-1974: The Record and the Challenge," *Journal of Soil and Water Conservation* 30 (1975) : 29-32.

[38] *Field Windbreak Removals in Five Great Plains States, 1970 to 1975* (Washington, D.C.: Soil Conservation Service, 1980), 1-15.

[39] Douglas Helms, "New Authorities and New Roles: SCS and the 1985 Farm Bill," in press. In an issue titled *Implementing the Conservation Provisions of the Food Security Act of 1985* (Ankeny, Iowa: Soil and Water Conservation Society).

The Great Plains Conservation Program, 1956-1981: A Short Administrative and Legislative History

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By Douglas Helms
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Enthusiastic supporters of the Great Plains Conservation Program recently gathered to celebrate the 25th anniversary of the authorizing legislation, signed August 7, 1956. The program was the latest of the nearly three-quarters of a century of local, state, and federal efforts to deal with

promoters tried to dislodge the notion that the region was not fit for agricultural settlement. The few who had pushed out onto the plains in the mid-1870s had to withstand both drought and grasshoppers.[2]

With the return of favorable weather in the